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A tale of symmetry and duality in neural networks

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We use a duality between parameter space and function space to study ensembles of Neural Networks. Symmetries of the NN action can be inferred from invariance of its correlation functions, computed in parameter space. This mechanism, which we call 'symmetry-via-duality,' utilizes a judicious choice of architecture and parameter distribution to ensure invariant network actions, even when their forms are unknown. Symmetries of input and output layers are analogous to space-time and internal symmetries, respectively, in quantum field theory. In simple experiments we find a correlation between symmetry breaking and training accuracy.

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